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(54) Pneumatic tire with superior irregular wear resistance

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Specifications

1. Title of the Invention

Pneumatic tire with superior irregular wear resistance

2. Scope of Patent Claims

(1) Pneumatic tire wherein the rubber portion in the vicinity of grooves set up on the tread's ground-contact surface possesses a thickness corresponding to 1/4 to 1/3 of block width between the respective grooves and it is constituted of rubber with higher wear resistance than tread rubber.

(2) Pneumatic tire wherein the rubber portion in the vicinity of grooves set up on the tread's ground-contact surface possesses a thickness corresponding to 1/4 to 1/3 of block width between the respective grooves and it is constituted of rubber with higher wear resistance than tread rubber, and both shoulder portions of the tread are similarly constituted of rubber having the above-described wear resistance.

3. Detailed Explanation of the Invention

This invention is related to pneumatic tire with improved irregular wear resistance of the tread.

Generally, the portion of the tire tread in contact with the road surface is made up of a single type of rubber. However, based on differences in the distribution of force acting on ground-contact surface pressure, differences in the distribution of motion of tread rubber, and differences in the distribution of slip rate, there arise portions with severe wear and portions with

little wear, the tread's ground-contact surface wears out unevenly, and the so-called irregular wear phenomenon occurs and the tire's lifespan, external appearance and the likes were extremely not preferred.

Previously, for irregular wear affecting the tread portion, irregular wear is prevented, for example as disclosed in Patent Publication 1976-100504 (S51-100504), by placing rubber with high abrasion resistance on the tread's shoulder portion. However, the inventors of this invention highlighted the differences existing in the motion distribution of the rubber inside the block between each of the grooves set up on other than the shoulder portion within the tread, namely on the tread's ground-contact surface, and this motion is large at the block's edge portion and relatively small at the block's central portion thus becoming the reason for the irregular wear on the block.

This invention completely eliminates the irregular wear that could not be improved previously, and as the essential point, it exists in pneumatic tire where the rubber portion in the vicinity of grooves set up on the tread's ground-contact surface is constituted of rubber having a thickness corresponding to 1/4 to 1/3 of block width between each of the grooves as well as being of higher wear resistance than tread rubber and both shoulder portions of the tread are similarly constituted of the above-described wear-resistant rubber.

The inventors of this invention initially investigated the wear conditions after traveling for 50,000 km using previous pneumatic tire of size 1000 R20 having 3 grooves on the tread's ground-contact surface, and the result is shown in Figure 1A. Figure 1A schematically shows the cross-section of tread portion after travel and based on this, irregular wear also occurred on each block other than shoulder portion, and it was judged that the wear was particularly severe on 2/3 of block width toward the center from the edge portion with regard to blocks 1 and 4, and on 1/3 of block width from both edge portions with regard to blocks 2 and 3.

Next, 2 grooves and 4 grooves were similarly investigated, and the results were schematically summarized respectively in Figure 1B and C. From Figure 1B and C, although there was a tendency for the width of portions subjected to irregular wear to become smaller when the number of grooves is smaller, it was judged that irregular wear arose in either one.

In this invention, if the Lambourne abrasion index of the tread rubber of the block's central portion is made to be 100 and rubber having high abrasion resistance of at least 110 on that index is used, the desired result cannot be expected at a thickness corresponding to not more than 1/4 of the block width.

Below, this invention is further described in detail by showing embodiments.

Embodiment(s)

5 types of size 1000 R20 test tires from 1 to 5 were prepared with tread portion rubber blends shown in Table 2 by using the 5 types of blended rubber A, B, C, D, and E (here, when the abrasion index of blended rubber A is made to be 100, the abrasion index of B, C, D, and E respectively becomes 110, 115, 120, and 120) differentiated by blending as shown in Table 1, and the extent of irregular wear on the tread's contact surface after traveling 50,000 km was observed.

Table 1

Blend	A	B	C	D	E
NR	100		50		50
BR		100	50		
SBR				100	50
Carbon black	40	50	65	60	55
Stearic acid	1	2	2	2	2
Zinc oxide	5	5	5	5	5
Sulfur	2	2	2	2	2
Sectional strength (kg/cm ²)	272	265	251	243	253
Sectional ductility	435	401	339	357	380
300% modulus (kg/cm ²)	159	183	220	200	191
Lambourne abrasion index	100	110	115	120	120

Table 2

Test tire No.	1	2	3	4	5
Rubber blend	A	A	A	A	A
Block's central portion		B	C	D	E
Block's edge portion					
Ratio of block edge against block width	0	2/3	2/3	1/2	2/5
Irregular wear	Have	None	None	Almost none	Have

Test tire No. 1 is that of previous pneumatic tire with the tread block portion's blended rubber being entirely blended rubber A, while test tires No. 2, 3, 4, and 5 are pneumatic tires of this invention with block's edge portion 6 respectively being blended rubber B, C, D, and E with high Lambourne abrasion index as against blended rubber A of central portion 5 as shown in Figure 2.

As can be seen from the results of Table 2, for the pneumatic tires of this invention, if the Lambourne abrasion index of the rubber that constitutes block's central portion is made to be 100, by placing rubber with Lambourne abrasion index of at least 110 so as to surround the groove vicinity with the block edge portion extending over 1/4 to 1/3 of the respective block widths, the contact surface of the tire wears out normally, irregular wear phenomenon is markedly reduced, and tire lifespan, safety and the likes are improved.

4. Brief Explanation of Drawing(s)

A, B, and C of Figure 1 schematically show the irregular wear conditions due to the travels of respective previous tires. Figure 2A is a vertical sectional schematic diagram showing 1 embodiment condition of a pneumatic tire from this invention, and Figure 2B is a vertical sectional schematic diagram showing another embodiment condition of a pneumatic tire from this invention.

The relation between symbols and the main portions represented is as follows:

- 5 ... block's central portion
- 6 ... block's edge portion

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Figure 1

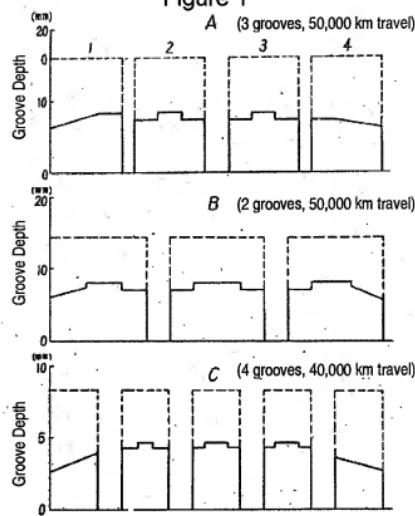
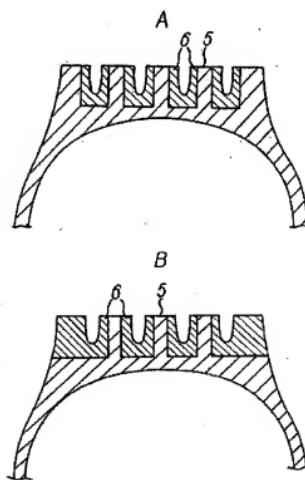


Figure 2



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⑮耐偏摩耗性に優れる空気入りタイヤ

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明細書

1. 発明の名称 耐偏摩耗性に優れる空気入りタイヤ

2. 発明の詳細な説明

本発明はトレッドの耐偏摩耗性を改善した空気入りタイヤに関するものである。

2.特許請求の範囲

(1) トレッドの接地面に設けられた溝周縁のゴム部が、各溝間のブロック巾の $1/4$ 乃至 $1/3$ に該当する厚さを有し且つトレッドゴムより耐摩耗性の高いゴムにて構成されていることを特徴とする空気入りタイヤ。

(2) トレッドの接地面に設けられた溝周縁のゴム部が、各溝間のブロック巾の $1/4$ 乃至 $1/3$ に該当する厚さを有し且つトレッドゴムより耐摩耗性の高いゴムにて構成され、さらに該トレッドの両肩部が上記の耐摩耗性のゴムにて同様に構成されていることを特徴とする空気入りタイヤ。

一般にタイヤトレッドの路面に接する部分は一種類のゴムで構成されている。しかし接地面圧に作用する力の分布の差、トレッドゴムの動きの分布の差、スリップ率の分布の差によつて摩耗のはげしい部分と余り摩耗しない部分とが生じ、トレッドの接地面が不均一に摩耗し、いわゆる偏摩耗現象が発生し、タイヤの寿命及び外観等においてきわめて好ましくなかつた。

従来、トレッド部のかかる偏摩耗に対しては、例えば特開昭51-100804号公報に開示の如く、トレッド肩部に耐摩耗性の高いゴムを配置することによつて偏摩耗を防止している。しかし本発明は

はトレッド中その肩部以外すなわちトレッド接地面に設けられた各溝間のプロック内でゴムの動きの分布に差があり、その動きはプロック端部で大きく、プロック中央部では比較的小さく、それがプロックに於ける偏摩耗の原因となつてゐることを見出した。

本発明は従来改善し得なかつた偏摩耗を完全に除去するものであり、その要旨とするところは、トレッドの接地面に設けられた溝周囲のゴム部が、各溝間のプロック巾の $1/4$ 乃至 $1/3$ に該当する厚さを有し且つトレッドゴムより耐摩耗性の高いゴムにて構成され、さらに該トレッドの両肩部が上記の耐摩耗性のゴムにて同様に構成されている空気入りタイヤに存する。

本発明者らはまず5本の薄をトレッド接地面に

有するサイズ1,000 R 20の従来の空気入りタイヤを用いて5万km走行後の車耗状況を検討し、その結果を第1図Aに示す。第1図Aは走行後のトレッド部の断面を図式的に示すものであり、これによるとトレッド肩部以外の各プロックにおいても偏摩耗が生じており、プロック1及び4においては端部より中心に向つて、プロック巾の $2/3$ 、またプロック2及び3においてはその両端部からそれぞれプロック巾の $1/3$ がとくに摩耗がはげしいことが判つた。

次に2本輪及び4本輪についても同様に検討し、その結果を第1図B及びCに、それぞれ図式的に略示した。第1図D及びEより漏数が少いほど偏摩耗する部分の巾が小さくなる傾向があるが、いずれにしても偏摩耗が生ずることが判明した。

本発明に於てはプロック中心部のトレッドゴムをランボン摩耗指数を100とした場合、110以上での該指数に該当する耐摩耗性の高いゴムが使用され、プロック巾の $1/4$ 以下に該当する厚さでは所定の効果が期待できない。

以下に実施例を示し、本発明をさらに詳細に説明する。

実施例

第1表に示す如くその配合を異にする5種の配合ゴムA、B、C、D、E(ここで配合ゴムAの摩耗指数を100としたとき、B、C、D及びEの摩耗指数はそれぞれ110、115、120及び120となる)を用いて第2表に示すトレッド部ゴム配合でタイヤサイズ1,000 R 20の1乃至5の5種の供試タイヤを製造し、5万km走行後のトレッド接地面

における偏摩耗の度合を観察した。

第1表

配合	A	B	C	D	E
NR	100		50		50
BR		100	50		
SBR				100	50
カーボンプラック	40	50	65	60	55
ステアリン酸	1	2	2	2	2
亜鉛粉	5	5	5	5	5
硫黄	2	2	2	2	2
切削強度(kg/cm ²)	272	265	251	243	265
切削伸度	435	401	359	357	380
300%モジュラス(kg/cm ²)	159	183	220	200	191
ランボン摩耗指数	100	110	115	120	120

第2表

供試タイヤ番	1	2	3	4	5
ゴム配合	A	A	A	A	A
プロック中心部	A	A	A	A	A
プロック巾に対するプロック端部割合	0	2/3	2/3	1/2	2/5
偏摩耗性	有	無	無	既無	有

供試タイヤ番エはトレッドプロック部の配合ゴムがすべて配合ゴムAで従来の空気入りタイヤであり、供試タイヤ番2, 3, 4及び5はそれぞれ第2図に示す如くプロック中心部6が配合ゴムAであるのに対し、その端部6がそれぞれランボン摩耗指数の高い配合ゴムヨリ、ロ、ロ及びヨリであり、本発明による空気タイヤである。

第2表の結果から明らかな如く本発明による空

気入りタイヤに於ては、プロック中心部を構成するゴムのランボン摩耗指数を100とした場合、プロック端部がそれぞれプロック巾の1/4乃至1/3にわたって磨耗面を包囲するよりランボン摩耗指数が110以上のゴムを配置することによつて、タイヤの該地面が正常に摩耗し、偏摩耗現象が著しく減少し、タイヤの寿命、安全性などが向上される。

各図面の簡単な説明

第1図A, B, ヨはそれぞれ従来のタイヤの走行による偏摩耗状態を図式的に示したものであり、第2図Aは本発明による空気入りタイヤの1実施形様、第2図Bは本発明による空気入りタイヤのさらに他の1実施形様を示す断面略示図である。

尚、図示された主要部と符号との対応関係は以

下の通りである。

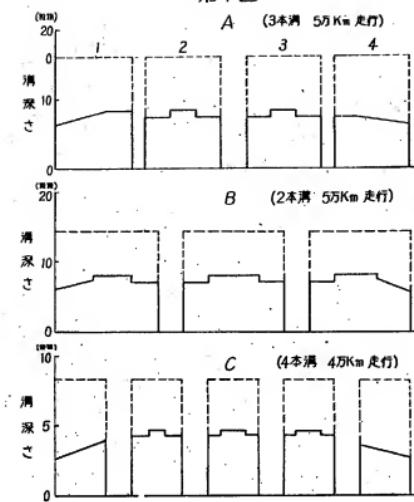
6…プロック中心部、6…プロック端部

特許出願人、ブリヂストンタイヤ株式会社

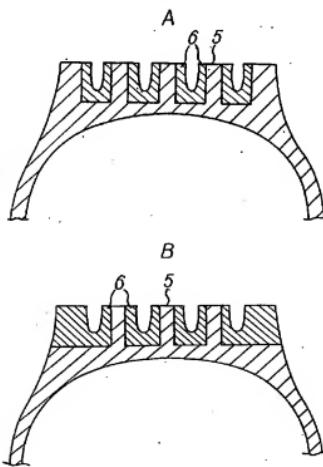
代理人 弁理士 田代久

同 同 田代久

第1図



第2図



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TITLE: PNEUMATIC TIRE WITH SUPERIOR IRREGULAR WEAR RESISTANCE
PUBN-DATE: July 17, 1978

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APPL-DATE: December 27, 1976
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ABSTRACT:

PURPOSE: To improve the irregular wear resistance of the tread of a pneumatic tire by constructing the rubber portion around the grooves formed on the ion at ground contact surface of the tread with rubber having higher wear resistance than that of the tread rubber.

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